CLAIMS

What is claimed:

1. A method of processing a substrate, comprising the steps of:

forming a first coating comprising a resist material on a substrate surface;

irradiating and developing the first coating to form a patterned first coating on the substrate surface;

forming a second coating over the substrate surface;

removing the patterned first coating while leaving the second coating to form a pattern on the substrate that is approximately the negative of the pattern formed by the first coating prior to its removal; and

using the patterned second coating as a protective layer while subjecting the substrate to further processing.

2. The method of claim 1 further comprising the step of removing the patterned second coating.

3. The method of claim 1, wherein the further processing comprises etching the substrate using the patterned second coating as a mask.

4. The method of claim 1, wherein the further processing comprises forming a third coating on the substrate surface.

5. The method of claim 4 further comprising the step of removing the patterned second coating while leaving the third coating in a pattern similar to that of the first coating.

6. The method of claim 4 further processing comprises etching the substrate using the patterned third coating as a mask.

7. The method of claim 6 wherein the third coating has a substantially greater dry etch resistance than the first coating.

8. The method of claim 1 wherein the second coating has a substantially greater dry etch resistance than the first coating.

9. The method of claim 1, wherein the second coating is composed primarily of organic material.

10 The method of claim 1, wherein the second coating is formed by applying a liquid solution to the substrate followed by curing.

11. The method of claim 1 wherein, the second coating is spin coated on the substrate.

12. The method of claim 1, wherein the first coating comprises a positive tone photoresist.

13. The method of claim 12, wherein the first coating comprises a novolac.

14. The method of claim 1 wherein the patterned first coating is removed by irradiating with actinic radiation followed by developing.

15. The method of claim 1 further comprising etching the patterned first coating to reduce feature sizes prior to forming the second coating.

16. The method of claim 4 further comprising etching the patterned second coating to reduce feature sizes prior to forming the third coating.

17. The method of claim 16, wherein after the patterned first coating is

removed, the second coating material forms a pattern having gaps of less than about 0.5 μm.

18. The method of claim 17, wherein, after the patterned first coating is removed, the second coating material forms a pattern having gaps of less than about 0.25 μm.

19. A method of processing a semiconductor substrate comprising:

forming a patterned first coating;

forming a second coating with a pattern that is the negative of the first coating pattern; and

selectively etching the substrate surface where the second coating is absent.

20. A method of forming sublithographic features in a substrate, comprising the steps of:

forming a patterned first coating on a substrate by coating the substrate with a resist, exposing the resist, and developing the resist;

etching the first coating to form a modified pattern that has features that are sublithographic for the resist and method of exposure used to form the patterned first coating;

forming a second coating over at least that portion of the substrate surface not covered by the patterned first coating;

removing the patterned first coating while leaving the second coating to form a pattern that is approximately the negative of the pattern formed by the first coating after etching; and

etching the substrate using the second coating as a mask.

21. A system for forming an inverse resist coating on a semiconductor substrate, comprising:

a chamber for patterning a first coating comprising a resist material on a substrate surface;

a first dispenser for depositing a second coating over the substrate surface;

a second dispenser for depositing a developer for removing the patterned first coating while leaving the second coating to form a pattern on the substrate that is approximately the negative of the pattern formed by the first coating prior to its removal;

a measuring system for measuring at least one operating parameter within the chamber, wherein the operating parameter is required for patterning the first coating, depositing the second coating, or depositing the developer for removing the patterned first coating;

a processor operatively coupled to the measuring system and at least one of the first dispenser and the second dispenser, the processor receiving operating parameter data from the measuring system and the processor using the data to control at least one of the first dispenser and the second dispenser to form the inverse resist coating.

22. The system of claim 21, wherein the measuring system comprises one of a scatterometry system, an ellipsometry system, an UV/vis spectrophotometry system, and an x-ray reflectometry system.

23. The system of claim 21, wherein the processor comprises a memory.

24. The system of claim 21 further comprising a CMP apparatus for planarizing the second coating with the patterned first coating, the measuring system is operable for measuring CMP characteristics, the processor operatively coupled to the CMP apparatus, and the processor using data to control the CMP apparatus.

25. The system of claim 21, wherein operating parameter is at least one of

etch rate, thickness, surface pattern, deposition rate, and development rate.

26. The system of claim 21 further comprising a third dispenser for providing a trim etchant to trim etch the pattern of the second coating, the measuring system is operable for measuring the trim etch, the processor operatively coupled to the third dispenser, and the processor using data to control the trim etchant.